UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Plant Pest Control Division
Washington 25, D. C.

November 29, 1962

SUBJECT: Telling the Plant Pest Control Story

TO: Plant Pest Control Division personnel

We are attaching a reproduction of a statement entitled, "Facts on the Use of Pesticides," prepared by the New York State College of Agriculture, Ithaca; and the New York Agricultural Experiment Station, Geneva; units of the State University at Cornell University. This statement deals with many of the questions asked relative to the use of insecticides and is a ready reference, which can be added to your packet or file for telling the Plant Pest Control story.

E. D. Burgess
Director

Attachment

FACTS ON THE USE OF PESTICIDES

Prepared by the New York State College of Agriculture, Ithaca, and the New York State Agricultural Experiment Station, Geneva, units of the State University, At Cornell University

In the more than 75 years that man has employed chemicals to control insects, fungi, rodents, weeds and other pests, he has become increasingly dependent on them. This trend has been especially evident since World War II. In general, chemical pesticides have proved highly effective in attaining desired goals, although they have certain objectionable aspects. One of these is their actual or possible hazards to man and other forms of life. Individuals of varying degrees of competence to make critical judgments in this field, have urged a drastic curtailment in pesticide use, and even a discontinuance of most of the synthetic compounds introduced in the past 20 years.

Since our economy, health, and recreational activities depend in large measure on the use of chemical pesticides, it seems timely and in the public interest to make an objective assessment of all aspects of this important subject.

Do we really need pesticides? This is hardly a debatable question. We not only need them, we are highly dependent on them, especially in the production of food and fiber crops. Without pesticides we would eat very poorly indeed in terms of both quality and quantity. Millions of people are alive today because of the use of DDT and other modern pesticides in suppressing insect-transmitted diseases of man such as malaria, yellow fever, and typhus. Witness, too, how we are relying on pesticides to stamp out the current outbreak of encephalitis in Florida. But if we use these materials, we cannot hope to be free from all possible objectionable consequences of their use. One such problem, for example, is the traces of pesticides that unavoidably may persist in or on some of our food crops beyond harvest.

Do these traces of pesticides constitute a health hazard to consumers? According to the best scientific evidence available, the traces that are allowed--and these are fixed by the Food and Drug Administration--constitute no known hazard. This question of allowable levels involves the "tolerance" concept. Its principle can be illustrated with table salt. As used in our foods, salt is employed at a safe or tolerable amount--for most individuals. At higher levels, however, it becomes a "poison." This was tragically illustrated in a Binghamton, N. Y., hospital recently when salt was accidentally substituted for sugar in the formula fed to newborn babies. All chemicals have their safe and toxic levels. For "toxic" materials such as certain pesticides these levels are simply lower than for table salt.

Before any pesticide can be sold it must undergo extensive feeding tests on laboratory animals. These tests may be continued for two years or longer, and involve several generations and thousands of laboratory animals. The FDA sets

a tolerance--zero or otherwise--on the basis of this information. This level always represents an amount far below any that may have shown the beginnings of trouble in test animals. It often reflects a hundredfold safety factor. Most laymen will still ask why we allow even these traces. Fortunately, much of our food is free from them. But what is the meaning of "free" when we now have instruments capable of detecting up to 1 part of pesticide in 1 billion parts of product? Short of not using the material at all, common sense calls for setting the allowable level low enough to meet all safety requirements yet not so low as to prevent the use of a needed product. This is exactly what the FDA attempts to do.

Do pesticides pose a serious threat to wildlife? As a preface to this section two facts should be appreciated: (1) the harm man has done to wildlife in felling forests, tilling fields, draining wet places, polluting waters, and through urbanization, is of much greater consequence collectively, than are the relatively small and temporary losses that have occurred from pesticide use, and (2) of the total land (and water) area of the USA, more than 95 percent receives no pesticides in a typical year; in the wildlands (about 75 percent of the total area) the figure is 99 percent.

As currently used in routine operations to control mosquitoes and pests of our farms and forests, the hazards to wildlife are generally considered to be small. In the past, greatest losses have occurred in special eradication programs, especially where high dosages of pesticides were used more or less indiscriminately over large areas. In the light of present knowledge, some of these programs were unsoundly based. That professionals in this field have profited from past mistakes is evidenced by the highly successful eradication programs against the screwworm fly and the Medfly that have been conducted recently in Florida. These were judged to have had little or no effect on wildlife. Wildlife protection is a common interest. Therefore, we can all subscribe wholeheartedly to a plea made by a committee established by the National Academy of Science - National Research Council to study pesticide-wildlife problems. It reported: "In order to hold wildlife losses to a minimum, scientists representing all of the disciplines involved should unite forces in an all-out effort to identify and evaluate specific hazards and to develop corrective measures for objectionable practices."

Are pesticides upsetting the balance of nature? This question implies that modern man is living under conditions of natural balance in relation to other forms of life. This is far from true regardless of where he lives, farms, or carries out his business enterprises. Man's progress, in fact, is largely measured by the degree to which he has been able to unbalance nature--to his advantage. It is often suggested that we use nature's tools to keep pests in check. Notice, though, that there are no "pests" in nature. Pests are a concept of man. Species fluctuate periodically in numbers through competition with one another, but this is of no consequence under nature's grand design.

Nature, we find, is usually much too slow and inefficient in control to meet man's standards. Anyone who has seen the eastern tent caterpillar totally defoliate wild cherry trees for two consecutive years before parasites, predators, and disease begin to get the upper hand will understand this. Scientists are exploring the possibilities of using biological methods in control. But experience to date shows that we cannot rely on them alone, particularly in intensive agricultural operations. To produce food at present high volume and quality we are dependent on chemical control measures primarily.

How much are pesticides misused? To some extent, of course. But such misuse is apparently no higher than occurs in any other similar human endeavors. A different logic seems to apply where misuse of pesticides is involved. This is the tendency to fix blame on the pesticide rather than on the person who misused it. When someone runs into a tree with an automobile, what or whom do we blame: automobiles in general, or the man who misused that particular one?

The number of farmers who willfully apply treatments nearer harvest than the law allows is quite small, for several reasons. Even if farmers were not law abiding as a group--and they are--pesticides are expensive and farmers tend to use them only when needed. They know, too, that pest control treatments applied near harvest usually are of little avail. Reference has already been made to the misuses that have occurred in relation to wildlife. We must also recognize that some pesticide misuses have led to serious illnesses and even deaths. Certain pesticides are toxic at low dosage levels, so in common with many other chemicals, fatalities can occur if they are accidentally swallowed, intentionally swallowed, or are handled with gross carelessness. There is no question that farmers, for their personal safety, should handle and use pesticides with respect. The pesticide safety record of the farm is remarkably high.

Should "less toxic" pesticides be used? No simple answer can be given to this question, as can be illustrated with two insecticides, parathion, and rotenone. Parathion is considered, rightly to be highly toxic to both insects and man; rotenone, on the other hand, is rated relatively "safe." The danger in parathion use is to the farmer who applies the material, not to the consumer who eats parathion-treated crops. This chemical disappears rapidly from spray deposits. It thus may be safer, from the standpoint of the consumer than some less toxic pesticide that lays down deposits highly resistant to weathering. Rotenone is relatively nontoxic to humans, but it is highly toxic to fish. In fact, it is commonly used to exterminate unwanted species of fish from certain ponds or streams before restocking with wanted species. It has been suggested in the interest of safety that plant-derived pesticides such as rotenone, pyrethrum, and ryania be used in place of DDT and the other synthetic organic pesticides. Although these well-known botanicals have found limited use over the years, experience has demonstrated that they are too inefficient generally to cope with the total pest problem. A primary goal of insect toxicologists is to find pesticides with maximum differential toxicity. These would be highly toxic to certain insect species but of low toxicity to man. Examples of such synthetic products are malathion and Sevin.

Are there satisfactory alternatives to chemicals for pest control? As of today, no. This is not intended to belittle nonchemical control principles. Some, such as the breeding of disease-resistant crop varieties, have proved to be highly successful solutions to certain problems. Even in such instances, however, chemical treatments may be needed to protect the crop from diseases and insects other than the one to which the plant is resistant. Other nonchemical principles being actively explored for practical application include: use of various microbial agents; use of insect and mite parasites and predators; manipulation of plant nutrition; and use of various agronomic principles, such as crop rotation and time of planting.

Another method that seems to have important possibilities is the genetic approach. A dramatic demonstration of its application is the eradication of the screwworm fly through mass releases of sterilized males. Sterilization can be effected by irradiation or more cheaply now, possibly, by use of certain chemicals (chemosterilants). The technique used to control the screwworm probably can be applied advantageously to other pests. But there are still other ways in which genetic principles can be manipulated to combat pests.

However, the final standard that all control measures must meet is: do they work? Thus for the foreseeable future we must continue to rely heavily on chemical methods to cope with critical pest problems. We will undoubtedly develop better pesticides--safer, more effective, and perhaps less subject to pest circumvention through the development of resistant strains.

Can pesticides induce cancer or cause gene mutations? This is a consideration that flourishes better in the realm of speculation than in fact. Based on the same "evidence" in this area one can project a given assumption to mean almost everything, or, conversely, almost nothing. The list of substances that have been identified as carcinogens (cancer-producing) is very large. The number known to be mutagens (mutant-producing) is smaller but includes such well-known chemicals as caffeine and, possibly, table salt. The significance of such ratings of chemicals in terms of actual hazards to humans in normal exposure is a much debated subject among scientists.

None of the synthetic insecticides in use today is either carcinogenic or mutagenic. As a matter of fact, any that should be judged to be carcinogenic must, by present law, be given a zero tolerance. DDT has been strongly suspected of being mutagenic by some persons. But in 1957 a well-known geneticist, Professor James F. Crow, reported: "This study shows that DDT as ordinarily used does not have a significant effect on mutation rate."

Conclusions

Both the chemical and nonchemical methods in use today to control pests are the result of research that has been done by thousands of scientists in state

and Federal agencies, in industry, in our universities, and in private institutes. These persons include entomologists, plant pathologists, chemists, horticulturists, agronomists, veterinarians, medical scientists, pharmacologists, wildlife specialists, and others. Collectively, they are aware of the areas of both strength and of weakness in all the methods in use. Where the limitations in a given method are serious, two courses of action are followed: one is to eliminate the objectionable feature if possible or to reduce its importance; the other is to find a new material or method that does not have the drawback.

The public can do two things to bring about a better program of pest control. One is to learn more about all aspects of this important subject. The other is to support research, especially on new approaches in which human health hazards are nonexistent or minimal, and to support programs that endeavour to establish the facts about health hazards, if any, in existing control methods.